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EXCAVATION OF THE EMERYVILLE SHELLMOUND, 1906

NELS C. NELSON'S FINAL REPORT



TRANSCRIBED AND PREFACED BY
JACK M. BROUGHTON



Emeryville Shellmound (ALA-309): Southerly wall of east part of Area 7, Area 8, west part of Area 9. Levelling of the mound in 1924. Compliments of the Phoebe A. Hearst Museum of Anthropology.

Cover Photo: Site of excavation, showing the grade of the mound, the railroad which cuts it at the extreme lower right hand corner and which runs on a level some eleven feet above its actual base. Compliments of the Phoebe A. Hearst Museum of Anthropology.

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Preface

Jack M. Broughton

INTRODUCTION

IN 1902, MAX UHLE pioneered stratigraphic excavations in American archaeology at the deepest site in the greater San Francisco Bay: the Emeryville Shellmound (CA-ALA-309). Since these landmark, turn-of-the-century investigations, Emeryville has become one of the most well-known archaeological sites in North America and has attracted relentless interest by archaeologists.

In 1913, E. W. Gifford (1916) used materials from Emeryville in his seminal analysis of midden constituents, launching an approach that would later become known as the California School of midden analysis (Ambrose 1967). In her 1929 study of the Emeryville avifauna, Hildegard Howard published what remains one of the premier analyses of bird remains from a North American archaeological site (Howard 1929). Artifacts from Emeryville have, of course, played a pivotal role in the development of central California culture history (Beardsley 1948; Bennyhoff 1986). Indeed, materials from Emeryville provided

the linchpin for J. A. Bennyhoff's influential shell bead typology, which would ultimately find application throughout California and the Great Basin (Bennyhoff 1986; Bennyhoff and Hughes 1987).

Even though the present location of the long-since leveled mound now sadly serves, in part, as a toxic waste dump for a Sherwin-Williams paint factory, research on the Emeryville collections continues unabated. In ongoing analyses of the human remains from Emeryville, G. Richards (in press) has revealed an unprecedented case of prehistoric cranial surgery in North America. L. Ingram and B. Berry are currently investigating late Holocene climatic fluctuations from strontium isotope ratios obtained from Emeryville shell samples as well as radiocarbon reservoir effects from charcoal and shell samples. I recently conducted a stratigraphic analysis of the vertebrate materials collected from the site. That analysis documented that the inhabitants of Emeryville had substantial impacts on local vertebrate populations (Broughton 1995).

Given the unparalleled historic and scientific value of the Emeryville Shellmound,

the following heretofore unpublished manuscript of Nels C. Nelson's 1906 excavation at Emeryville will be of great interest to scholars of both shell middens and the history of American archaeology in general, and to California archaeologists in particular. This report, manuscript number 348 of the Archaeological Research Facility, University of California, Berkeley, describes in great detail the excavation of, and the materials obtained from, a six-foot square unit sunk to the base of the east side of the mound. Complete with original plates and a large series of detailed maps and figures, the manuscript represents an account of one of only three major excavations at Emeryville.

In 1906, the year of the excavation, Nels C. Nelson was a graduate student of the fledgling Anthropology program at U.C. Berkeley, a program that was led by Frederic Ward Putnam and funded by Phoebe Apperson Hearst. The actual excavation was conducted by Nelson, A. V. Wepfer, and Pliny E. Goddard from May 28 to June 20, under the supervision of Samuel A. Barrett and John C. Merriam (see pages 34-36 of this volume for correspondence concerning the excavation). At the time, Wepfer, Goddard, and Barrett were also graduate students at Berkeley, while Merriam served as an Assistant Professor of Palaeontology as well as a member of the Advisory Committee which guided the young Department of Anthropology (see Thoresen 1975).

As a descriptive report, Nelson's 1906 manuscript provides far more detail on the character and composition of the internal structure of the Emeryville Shellmound than either Uhle (1909), whose earlier work was quite thorough, or Schenck (1926), whose efforts were certainly compromised by the salvage setting into which he was thrust. In fact, Nelson's highly detailed descriptions of the various natural strata and his meticulous excavation methods rival the standards of many current projects.

In the tabulation of artifact frequencies stratum by stratum, this report compares with the careful work of Uhle and hints of Nelson's later investigations in the Galisteo Basin (Nelson 1914) and the Tano Ruins (Nelson 1916). However, by presenting frequency data for major vertebrate classes stratigraphically, Nelson's report goes beyond what Uhle, Howard, or Schenck managed to provide. Moreover, because Nelson carefully recorded provenience information for the specimens he collected, including vertebrate remains and bulk sediment samples, and most of these materials remain at the Phoebe A. Hearst Museum, stratigraphic analyses can still be conducted with these data.

While Nelson's published interpretations of the San Francisco Bay shellmounds (Nelson 1909, 1910) have been regarded as cautious, in contrast to the later well-reknowned insights that emerged from his work in the Southwest (Willey and Sabloff 1974:63), the present report exhibits a concern for many issues that most would associate not with the turn-of-the-century, but with an American archaeology of only the last few decades.

In many respects, Nelson was an archaeologist in advance of his time. This is nowhere more evident than in his analysis of the structure and composition of the Emeryville Shellmound. Based on characteristics of the sediments, such as particle shape and size, orientation, degree of weathering, and the frequency distribution of these variables within and between strata, Nelson attempts to decipher the complex processes that formed the mound. In so doing, Nelson's insights of 1906 foreshadow the current emphasis in archaeology on formation processes and taphonomy. The manuscript contains many such precocious archaeological insights.

A NOTE ON EDITORIAL POLICY

The method of transcription I have employed follows accepted principles and conventions for the textual editing of histori-

cal documents (see Tanselle 1978; Burkhardt and Smith 1985:xxvi-xxvix). I strictly follow Tanselle (1978:48) in his recommendation that transcribed historical documents "should not contain a text which has editorially been corrected, made consistent, or otherwise smoothed out." I have preserved intact the spelling, capitalization, punctuation, footnote style (but numbers have been added), and grammar of Nelson's original manuscript. I also note that the original manuscript contains marginal comments and editorial suggestions made by J. C. Merriam, for whom the manu-

script was originally prepared. Since these comments or corrections were mostly illegible and/or stylistic in nature, I have not incorporated them here. In some instances I could not clearly decipher Nelson's writing. In such instances I have employed the following standard conventions:

[some text] 'some text' is the probable reading of a word that was difficult to read;

[some text] 'some text' is a description of a word or passage that could not be transcribed, e.g., *one word illeg.*

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Excavation of The Emeryville Shellmound,
being a partial
Report of Exploration for the Dep't. of Anthropol.
During the year
1906.

N. C. Nelson

Outline

I. Dr. Uhle's Work

1. Nature of excavation
2. Results
3. Conclusions

II. Supplementary Excavation

1. Location + Construction
2. Method of Work
3. Nature, Extent and General Results (Statistics)
4. Structure and Composition of Mound
5. Collection:
 - a. Rocks
 - b. Animal Bones
 - c. Artifacts
 - 1.) Stone
 - 2.) Bone etc
 - d. Human Remains

Report

Nels C. Nelson

DURING THE SUMMER of 1906 the Department of Anthropology of the University of California resumed systematic investigation of the shellmounds in the San Francisco Bay region. The work was carried on by A. V. Wepfer, a graduate student, in conjunction with the writer, under the immediate supervision of Professor J. C. Merriam. Two large mounds, one on the east, and the other on the north shore of the Bay, were chosen for operations, the work being completed only on the first named site, of which alone the following furnishes a partial report.

This east shore mound, forming at present a conspicuous feature of the recreation grounds called Shellmound Park, is the largest of what was originally a cluster of a half dozen or more, located on the alluvial flat at Emeryville, a suburb of the city of Oakland. The immediate attraction of this spot as a dwelling site was probably the small Temescal creek which, in its course from the foothills

east of Berkeley to the Bay, passes the mound on its south side at a distance of 200 feet. This mound, it should be explained was the object of extended exploration by Dr. Max Uhle and Professor J. C. Merriam of the Department five years ago, the report of the work having been published by the University only recently;¹ and the present investigation was undertaken mainly to corroborate or modify certain exceptionally striking results then obtained. In order, therefore, to make clear the actual relation of these two interdependent investigations, it seems necessary here to restate briefly the nature and result of the former undertaking.

Quoting measurements from Dr. Uhle's report (p 3), the Emeryville mound has the form of a truncated cone, with an east-and-

1 Max Uhle—Emeryville Shellmound. Univ. of Cal. Publications Am. Arch. and Ethnol; Vol VII, No 1.

west basal diameter of 270 feet, and a diameter of 145 at its top, which is 27 feet above the level of the immediately surrounding plain. This plain in turn has an elevation of from three to four feet above high tide level, the approaching waters of which are at present less than 130 feet from the superficial western base of the mound. On the north side the cone slopes gradually, and, according to Dr. Uhle's findings extends a hundred feet farther out over the plain; to which may now be added the later ascertainment that disintegrated shell and refuse, several feet deep, extends actually 150 feet beyond the 100 foot mark, or in all 385 feet from the center of the mound.

Dr. Uhle chose the west side of the mound as the one best suited to his purpose, and began a radial cut, from five to ten feet wide, running it towards the beach as far as necessary to ascertain the real peripheral limits, and towards the center just as far as time and conditions permitted (pp 7, 8 + 9). The truncated top being encircled by a cypress hedge, and also crowned by a large pavilion, it was impossible to carry an open trench across the mound; but it was run within twelve feet of the hedge, and from that point a tunnel was driven twenty-three feet farther, i.e., eleven feet inside the upper perimeter and to within sixty-one feet of the cones actual center. The total length of this excavation was something over 125 feet. At both its extremities, and also at intervening intervals the trench was sunk to a sharply defined yellowish alluvial clay, at the original surface upon which the mound rests (pp 9 + 10). This bottom surface at the inner end of the cut, or at about 70 feet from the mound's center, gave indications of a slight rise eastward, while westward, along the trench for a distance of 55 feet, it continued perfectly level, but was [— and this is the remarkable fact—] two feet below the level of high tide. In the next 35 feet the bottom fell one foot and seven inches and in the last 17 feet it rose again one foot and

three inches (1 ft. 3 in), to where the basal periphery of the mound terminated between layers of clay, at a point 177 feet from the mound's center.

The trench and tunnel together furnished only a partially complete radial section of the mound; but, nevertheless, enough to reveal its interesting structure. Dr. Uhle observed ten fairly distinct layers with conforming planes of deposition. The upper six of these layers dipped, more or less uniformly at the same angle as the surface of the mound while the remaining four layers followed practically horizontal planes. From this fact Dr. Uhle infers that two different principles governed the growth of the mound and suggests that it probably signifies a change in the character or culture of its inhabitants (pp 15 + 16). In addition to these layers there were noticed also many small but independent beds of ashes, mixed with charcoal and large blackened pebbles, as evidence that fire was continually used in the preparation of food (p 19).

In working out this excavation, some 200 cu. m. of characteristic mound material, composed mainly of mussel, clam and oyster shells, was carefully sifted over and made to yield in all 570 artifacts, besides a large quantity of whole and broken rocks, together also with fragments of osseous remains of many different species of mammals, birds, and fishes. Of the 570 artifacts, however, 88, largely decorative objects, were found with five out of ten different burials occurring in the sixth, seventh and eighth layers, of which, they cannot properly be counted as representatives. From the fact that no interments were found in the upper layers, coupled with the signs of charred remains in the same, Dr. Uhle conjectures that the last mound dwellers probably practiced cremation, and would in so far seem to be a new, and a third type of inhabitants (p. 37).

The uncovered artifacts are mostly imple-

ments of bone and stone, finished to differing degrees of perfection and for more or less evident purposes. Speaking of the artifacts as a whole, it must suffice to say that they comprise a variety of shell and bone beads, pendants of stone, shell and mica; several forms of awl and blunt-pointed implements made of bone, and in two cases of stone; straight and curved bone needles with and without perforations (eyes); chisel-like implements made of antler; about a dozen notched bones; quite a number of ground mortars and pestles, mostly in a fragmentary condition; some grooved stone sinkers; some hammer like stones; "charmstones" of several different forms; a few soft stone pipe-bowls and cylindrically worked stones with longitudinal perforations; some fragments of obsidian spear and arrow points, together with a few unshaped pieces of the same material; and finally, a large number of mostly reject chert flakes. These are, besides, a number of complete and fragmentary pieces of a (more) doubtful nature. The objects of the collection, if laid out according to their relative vertical positions in the mound, exhibit as viewed from the bottom up, a gradual but decided perfection of workmanship, and also an increasing differentiation and fixity of types. Excluding mortars and pestles, ground stone implements, with one single and peculiar exception in layer eight, all occur near the surface. The same is the case with obsidian, while the roughly flaked chert fragments increase rapidly towards the bottom. The awl type of implement, of which more than one hundred specimens were found, occur in all the layers; but it must be distinctly emphasized that those from the lower layers are all merely rough bone splinters one end of which was pointed enough to be of use.

From the foregoing facts, Dr. Uhle concludes (1) that the mound represents culturally two, and probably three, quite distinct peoples or stages of development (pp 15 + 40)

and (2) that since the deposition of refuse began, the solid surface upon which it rests has sunk at least three (3) feet, which suggests aside from the great volume of the mound itself, the probable remote date at which man inhabited the Pacific Coast.

SUPPLEMENTARY EXCAVATION

The object now of further investigation being chiefly to supplement and verify Dr. Uhle's findings, a spot was selected on the land side of the mound as nearly opposite the former site of excavation as convenient for work.² From the assumed center of the mound a northeasterly meridian was determined, and on the north side of this line was laid off area for a vertical six foot square shaft, the center of which was about twelve (12) feet horizontally outside the upper perimeter of the truncated top, and eleven feet and eight inches (11 ft. 8 in.) below its level.³

The mound having at this point a nearly fifty percent grade, it was necessary to erect a bulkhead on the side hill to retain all the material for refilling the shaft, so as to cause no inconvenience to the owner, Captain Seeby, who throughout the month while we were at work extended us every courtesy. In order also to facilitate and fix all measurements, a horizontal curbing was built at a convenient level above the surface its inner vertical planes being flush with the perpendicular walls of the shaft. Along the edges of the up-and-downhill faces of this curbing yardsticks were nailed on which to read horizontal distances from the meridian wall. For the other horizontal measurement a sliding "straight-edge", likewise provided

2 The two excavations lacked nearly 50% of being exactly opposite.

3 For relocation of shaft site, levels etc., consult diagrams in accession envelope No. 206.

with yardsticks, was used: and from this also the weighted tape was dropped to any desired point in the shaft for vertical distances. In this simple manner the objects were fixed by three measurements, taken almost at a glance, and with but one or two movements.⁴ It is possible, of course, that horizontal measurements for so small an area may never be of any scientific value, and in cases of ordinary rocks or very common and insignificant fragments of animal bones, groups were made, and only the average location taken. Beyond these constructions no timbering was found necessary, the mound material being compact enough to justify sinking the shaft without casing.

When actual excavation began a division of responsibilities was made, one attending to the shaft, the uncovering and location of objects; while the other, who remained at the surface, read the measurements and also numbered and packed the specimens. Each worker took notes on his own particular [phases] of the work, but on many points of special or peculiar interest these overlapped not a little.

The material of the shaft, while varying

4 It should be explained that measurements given in the catalogue are those taken from the above mentioned horizontal curbing; and, furthermore, that as the tape used has since been found one inch short in every six feet, a double correction has to be made for any absolute depths desired.



Site of excavation, showing the grade of the mound, the railroad which cuts it at the extreme lower right hand corner and which runs on a level some eleven feet above its actual base.

After four weeks of such slow and careful procedure the bottom of the mound material was reached at an average depth of thirty-three (33) feet, measured from the mound's leveled top. The sharply defined transition from shell into clay, shown in cat. No. 9894, occurred between four and five inches below the practically constant water level—except in

The volume of material thus turned over amounted to 774 cubic feet. And, scattered somewhat unevenly through this mass, comprising eleven distinct layers, were found about 1100 rocks and larger pebbles; something over 2000 animal bones, mostly in fragmentary state; and 70 artifacts with an additional 5 collected from a burial, and still another 20 of a more doubtful nature, 15 of which were also obtained from a grave. Presented statistically the results are as follows:

[illegible]

There is evident danger, however, in attaching too rigid significance to these figures; but in a general way they may have something to tell. For instance, it seems a little startling, indeed, a priori improbable, that in the eleventh layer, amounting in volume to nearly half the contents of the entire shaft, there should have been found only *one* fish bone, when that one might easily, in spite of all possible care, have fallen from somewhere in the walls above. On the other hand, if this bottom layer is taken as lacking all fish remnants, and the remainder of the column is literally accepted, it tells, in the light of the other figures, a rather doubtful story. Nevertheless, Dr. Uhle records only two finds of fish bones (Nos. 672 and 901) in the tunnel or lower layer excavated by him; which lends some support to the possible view that these peoples had not yet accomplished the art of fishing.⁵ The fact that sting-ray spines occur in the lower layers on both sides of the mound is not conclusive, as at the spring season scores of these monsters are often observed dead or dying on the beach where the receding tide waters have left them.

STRUCTURE OF THE MOUND

The internal structure of the mound, as exhibited by the perpendicular walls of the shafts, was of such order as to require detailed consideration. In all, eleven distinct layers of alternating light and dark-colored material were recognized. The varying thickness of these layers, their slope and general contour, were carefully recorded, and samples of each were preserved, together with samples also of every special occurrence such as pockets of clear ash, streaks of unmixed and unbroken shells, and other unusual formations. The

variation in color of these layers, it should be made clear, was not owing to any sudden changes in the shell species represented, but due entirely to the nature of the material in which the shells were imbedded. In the light colored layers the matrix was ashes; in the dark-colored layers, a black earthy substance; all shells in the former being charred, while in the latter they showed no evidence of having been subjected to heat. At the same time bits of charcoal were very common throughout all the black layers, and No. 9888 is a sample of a clod of ashes found in the bottom layer which otherwise contained no signs of burnt shell.

As may be observed on the accompanying diagram of the meridian wall, the upper five layers slope almost uniformly with the surface of the mound; while the next five, besides being thinner and more irregular, tend towards a more horizontal grade. Especially is this true of the surface of layer VIII, and to a less degree of layer VI. Finally, the surface of the eleventh, or bottom layer has a rise of only eight inches in six feet. Following is a detailed description of the individual layers.

The top layer, designated I, (sample 9869) was simply surface soil, long subject to vegetative processes; and hence, when fresh, a fine-grained black substance, which however on closer examination, reveals its shell composition. This layer, partly sod, was about one foot deep, and shaded very gradually into a coarser material of a lighter color. It contained no artifacts and but few animal bones were found.

The main part of layer II (Sample 9870) was of a uniformly porous texture, the composition being made up of mediumly broken mussel shells with a small amount of considerably larger clam shell fragments—the whole imbedded in a fine grained material much like that of the layer above. A few small pebbles were noted in it. Some exceptions to the general uniformity occurred here and there in

5 Dahl, W. J.—Contrib. to N. A. Ethnol. Vol. I. p 77—thinks that the shell heaps of the Aleutian Islands are *devoid* of fish bones in lowest layer.

the form of small clods or pockets made up of more finely broken burnt shell and yellowish ashes (see sample 9871). In fact the uphill wall showed an irregular streak of this composition running almost the whole six feet, separating layers I and II. The occurrence may be observed in upper central part of plate , which in fact gives a fair idea of the first four layers as they occurred in the uphill wall.⁶ Another peculiarity was an abrupt "sink" of the material of the second layer perpendicularly into and practically clear through the next underlying layer.⁷ But for this fact layer II was little more than a foot in thickness. It yielded as shown in the preceeding table, the first artifacts; and on filling the shaft a complete adult skeleton, Pl ? , was also found in this layer just outside the uphill wall limit.

Layer III, sample 9872, also about a foot thick, was much like the special occurrences just mentioned, the only difference being that here, in the third layer, the shell fragments were larger and the ashes several shades more yellow.⁸ Oyster shells were also more noticeable. Pebbles were not uncommon; and quite a few bits of burnt clay, having more or less of form and marks to indicate that they had been brought to their state of hardness while incased in a bivalve of some kind. Number 9609 e.g. was evidently the contents of a mussel shell. Apparently, the mollusc gatherers used little discrimination. Calcined bones, some of them burned to a chalk color, with now and then a bluish tinge,⁹ were fairly abundant, and rocks of fist size showing the effects of heat were frequently met with. Animal bones were more numerous here than in any other layer, but only three artifacts

occurred. A separate human skull was also accidentally discovered at this level but outside the shaft limits. The special variations of this layer consisted of several rather large white masses of what appears to be completely calcined bone and shell (see 9873). These accumulations may mark fire places; although general appearances hardly favor such a view. Note for instance the angle of the mass shown the diagram. Aside from these peculiarities, this layer corresponds closely to the second, third and fourth layers by Dr. Uhle from the west side of the mound.¹⁰

The thickness of layer IV almost equaled that of the sum of those already described, its volume being in fact greater, owing to a steeper grade. This layer, very sharply defined from those above and below, was of uniformly fine and consequently compact structure—except for an occasional thin streak of unbroken shells lacking matrix; and presented a homogeneous grayish-black appearance. Its composition was mainly mussel shell, with an occasional fragment or even a complete valve, of clam and oyster. Small pebbles and bits of charcoal were noticeable; but, as the table indicates, artifacts and animal bones were comparatively scarce, rocks being however, slightly in excess of previous occurrences. A burial lying partly outside the shaft was discovered in this layer, and with this occurred the only samples of obsidian found in the excavation. A small mass of unusually fine black material (no 9875) was found in the uphill wall: at the time of collection scarcely a sign shell could be detected in it, but on shaking the powder in its dry state shell is quite apparent.

Layer V (no 9896) was again light colored, much like the third layer and the special occurrence in the second. In fact the light

6 See also field sketch II.

7 See also field sketch II.

8 That is, in the fresh and moist state.

9 The blue looks as if due to presence of copper.

10 See pp. 22 +23. [Max Uhle—Emeryville Shellmound. Univ. of Cal. Publications Am. Arch. and Ethnol; Vol VII, No 1. (title added by editor)]

colored layers did not (really) vary enough in color and composition for me to state the difference in words. The ash layers were all yellow, with occasional specks of rusty red brick dust due to disintegrating fragments of red sandstone. If anything, the ashes here were of a slightly duller, i.e., grayish color. The same kinds of shell; all of them charred, continued; and in addition, a fragment of cardium shell was noticed. Rocks increased in frequency, otherwise there was a notable dearth of material for collection. The layer averaged fully a foot in depth, but practically "pinched out" in the down-hill wall. The only thing unusual in the structure of the layer was a streak of clean, unbroken shells (no 9877) occurring in the uphill wall.

The matrix of layer VI was nearly black in color; but the composition as a whole was coarser and less compact than the fourth layer. This coarseness was apparently due to a lesser abundance of fragile mussel shells. However, the more resilient oyster shells were here also almost a negligible quantity. The forty-eight cubic feet yielded only one artifact: rocks also were unusually scarce; while animal bones occurred with the same frequency as in the layer above. The depth of the material was something over one foot; and its composition was uniform throughout with the exception of a thin streak of exceedingly fine-grained substance, (no 9879), practically devoid of shell, which occurred in the uphill wall.

In layer VII there were two distinguishable kinds of ashes, the main part of the usually light yellow mass (no 9881) being overlaid and underlaid by thin wedges of much darker, i.e. grayish hue (no 9880). The burnt shell were perhaps a little more finely broken than customarily in the light-colored layers—especially was this true of the darker parts of the layer. Small and tiny pebbles were noted. There was a prevailing dearth of artifacts, but animal bones and rocks showed a decided increase. This was the thinnest

layer thus far worked: starting from the uphill wall over a foot deep, it suddenly dropped to a thickness of six inches, and tapered out to even less as it approached the opposite wall.

Layer VIII reversed the wedge and tapered from barely one foot to less than four inches in depth as it entered the uphill wall. This layer was made up of whole and coarsely broken shells imbedded in a rather scarce grayish-black matrix (no 9883). Pebbles were less, and charcoal more noticable than usual: rocks were more plentiful than hitherto but artifacts, and particularly animal bones, were scarce.

Layer IX, the thinnest in the shaft, was made up of quite finely broken burnt shell, imbedded in a grayish ash (no 9883), just a shade darker than 9880. Pebbles were noticeable as were also occasional bits of oyster shell. Bone artifacts, entirely absent from the two preceeding layers, reappeared; but the single find, in the shape of a broken awl, is a little doubtful owing to circumstances connected with its uncovering. Animal bones showed an enormous increase numerically, whole rock continued almost the same as above. The layer averaged scarcely six inches in thickness, and might, so far as its composition was concerned have been related to the layer below, just as in the seventh layer two distinctly light-colored compositions were considered as belonging together, the darker colors in both cases being the result of contact with black layers.

The lowest of the light colored mixtures, designated layer X, tapered from a thickness of almost three feet in the uphill wall to a mere thin streak on the opposite side. (As a matter of fact, it ended about one and one-half feet beyond the downhill wall, as was found later by letting the wall cave in.) The layer

11 The dry samples as now preserved give no correct idea of now the freshly cut walls appeared.

was composed of mediumly broken burnt shell, bits of burnt clay and pebbles, imbedded in a light yellowish ash,¹¹ (no 9884). No. 9885 shows an odd occurrence of pure clean whitish ash found midway in the layer. Artifacts occurred in greater abundance than in any other layer, while rocks and animal bones little more than held their own. Completely calcined bones with the aforementioned bluish tinge were also quite common.

We have at last the bottom layer. For a distance nearly nine (9) feet this division maintained an almost uniform blackish color, and apparently a homogeneous composition. The samples, Nos. 9890 to 9894, taken at the surface of the layer and at every two feet thereafter down to the last, which gives the clay bottom, indicates only a slight increase in the size of the shell fragments, beginning about two feet below the surface and lasting to the bottom. There was also in the last two or three feet, which was decidedly moist and sticky, a noticeable white tinge imparted to the matrix, due probably to a solution rather than mechanical breaking up of the shells. At the surface of the layer e.g., to show contrast, the shells were finely broken and the whole mixture had the appearance, when fresh, of a fine black mould, exactly like the top sod; and inasmuch as the surface of layer XI was about on a level with the gently rising plain east of the mound, it seems not impossible that this fine grained material may at one time have been subjected for quite a long period to vegetative actions. There were, however, no further visible signs to substantiate such a view.

Considering this layer as a whole, it may be said not to agree entirely with Dr. Uhle's findings on the opposite side of the mound as regards stratification. Dr. Uhle found the "planes of deposition" to be practically horizontal, and has indicated them on his sketch PI IV, fig 2; but, strictly speaking, here, in the walls of the shaft, there were no planes

of deposition observable. The whole layer seemed one homogeneous mass devoid of structure so easily noticed in the layers above; so that while there was little to dispute the natural supposition that the strata were horizontal, there was nothing to prove that such was actually the case. Depositions of comparatively long animal bones e.g., seemed to occur at any angle.

Pebbles of all sizes were noticeable throughout, and charred bones (no 9658) and charcoal continued in abundance right to the surface of the clay bottom. This last statement may be verified by a close examination of number 9894, a sample showing the transition from black mound material to pure yellow clay to take place in less than a two inch space. Of special occurrence there were a couple of cubic feet of unusually coarse material (no 9886) located at the surface of the layer in the uphill corner next the meridian wall; a thin streak¹² 2 1/2 ft below the surface of extra finely broken shells, oysters among them, no 9887; small clod of ashes mixed with a few burnt shells, 9888, found four feet down in the mass; and also a small piece of red ochre-like material obtained below the water level.

In regard to finds this heavy layer presented some striking peculiarities, the tabulated statement being here quite misleading. The first foot of this material yielded fourteen (14) artifacts, about two-hundred (200) rocks, and something over three-hundred-twenty (320) animal bones; and the greater portion of this collection was found *in* or very close the surface. The rocks and bones were generally larger and less broken up than hitherto; but the size and number of the finds excepting rocks decreased considerably below this level; became in fact at times even scarce, until near

12 This streak was nearly horizontal, and about the only sign suggestive of the horizontal stratification of layer XI.

the bottom, where they again occurred, if not in large numbers, at least in unusual sizes representing large animals. The rocks decreased only gradually both in number and size towards the bottom.

The incomplete remains of an adult were also found in this layer about three feet below its upper limit, and sixteen feet below the side-hill surface of the mound.

In view now, of all the foregoing details, the internal structure of the mound, taken as a whole, presents some curious problems. The apparent double principle of construction suggested by Dr. Uhle is strongly confirmed. That is to say, judged from this last excavation, when the so called tenth layer began to deposit, the mound was a broad nearly flat topped pile, which had for some lengthy period supported vegetation. It is however likely that deposition began near the center of this old substructure, and that further excavation of the upper part of the mound in the direction of the center would reveal layers in addition to the ten now obtained near the periphery. It seems also most plausible, in the light of many little and, taken separately, insignificant facts, to suppose that the material comprising these alternating light and dark colored layers is not in its original place of deposition; but was, after undue accumulation on top of the central superstructure, scooped out over its edge and down a gradually steepening incline, to stoop only at the surface of the older mound. On this hypothesis too may probably be explained the remarkable accumulation of rocks, animal bones etc. on and near the surface of layer XI as already mentioned. In scooping refuse over the edge of the superficial mound, however, large bones and all heavier objects would roll in most instances to the bottom of the incline and would be covered up gradually as the lower periphery of the superstructure expanded. Here e.g. were found the largest and best preserved bones, among them a complete

carnivor skull and part of a deer skull with both antlers, in perfect condition, still attached; together also with several other finds of complete but separate antlers. Furthermore, on the basis of what is now known, if the whole top of the cone should be lowered by, say ten feet, there would probably be revealed an array of concentric circles of alternating light and dark colored material. Some of these circles would be very thin and others comparatively thick; and one need hardly suggest that the material was not originally laid down in this fashion. The oft referred to clods of cemented ashes and the slanting position of the larger masses of such material would alone negative such a supposition.

But precisely how did these alternating layers originate? Do the light and dark colored variants represent different cultures, each remaining for some considerable period of time, or do these layers simply represent seasonal variations in the mode of life of an identical people? If the latter, then the upper part of the mound at least need not be considered very old; although it almost certainly anti-dates the advent of Europeans. But that the variations are merely seasonal is hardly, in view of the volumes represented, an entertainable hypothesis.

Turning to the substructure, there is ground here also for believing that the material composing it is not in the place of its original deposition. The lack of stratification or structure to this mass has already been referred to. In addition there is the occurrence of a single small clod of ashes, no 9888, four feet below the surface of the layer. Its presence is strange and unaccountable. It might have been intruded from the surface, as was probably the case with burial no 4, only five feet away and one foot nearer the upper limits of the layer; but there was no sign of disturbance. The homogeneous nature of the layer, however, coupled with the fact of a consider-

bance. The homogeneous nature of the layer, however, coupled with the fact of a considerable increase in the size of the shell fragments, and the increased number and size of animal bones found near the bottom, leads one to the strong notion that it was formed after the same manner as the superstructure. Furthermore, on what other reasonable supposition can be explained the fact that fragments of mortars and pestles, implements of bone and antler etc. were found in close proximity to the clay bottom, their workmanship being equal to that of artifacts found much nearer the surface. In fact, though the types of artifacts extracted from the shaft differ in some respects, the difference is not absolute; and the quality of the workmanship is not so widely different as might reasonably be expected, considering the great period of time involved. Charcoal and other signs of the use of fire also continued with undiminished frequency to the bottom as another indication of the similarity of culture represented. Dr. Uhle clearly found conditions quite different on the west side of the mound there being a striking gradation in the kind and quality of implements used. But it seems clear that investigation of the Emeryville Shellmound cannot be considered satisfactorily complete until something like an open trench has been carried clear across the mound laying bare its core.

In regard to the various species of shells represented in the mound material, little need (perhaps) be said here as no identifications have been made. Unscientifically speaking the body of the shell refuse was made up of clam and mussel shells, with a few oyster shells irregularly interspersed, and in addition a few samples of cardium shells. Only two univalves were found, and these of different species. Dr. Uhle identifies (p 16) no less than nine dif species and two subspecies.

THE COLLECTION

Rocks—The occurrence of rocks throughout

the shell refuse may perhaps necessitate little further comment. The specimens, mostly sandstones, with a few samples of a tufa-like material, are in the form of whole and broken boulder varying in size from large pebbles up to two and three pound weights. Those from the ash layers show marked effects of heat. Some of them e.g., are cracked and brittle (and many, when dry, emit on being stroked with the hand, the sound peculiar to burnt brick.) Others are blackened, not only on the surface, but partway through. Stone obtained from the black layers show much less, and sometimes no, signs of heat; though possibly expert knowledge may reach a different conclusion. Several specimens, particularly from the black layers, still have remains of barnacle scales on them, showing that they were picked up on a stony beach—such as is not now found for miles either north or south.

Of flint or chert there was obtained only ten pieces. One of these, however, no 9602, a piece of rather striking color, was found with a burial in the fourth layer; with which occurred also no. 9601, a small agate-like pebble, evidently also valued merely for its beauty. In this grave, moreover, was obtained eight pieces of obsidian, the only samples found in the excavation. But of chert strictly belonging in the fourth layer, there were only two pieces. One of them, no 9618, was classed among the artifacts (but probably wrongly so) owing to its axe-like shape, due most certainly, however, to natural cleavage. In the remaining seven pieces, there were found in the tenth, and four in the eleventh layers. This slight increase of chert towards the bottom agrees with Dr. Uhle's findings; about 100 specimens having been obtained by him in the lower layers on the opposite side of the mound, the apparently great discrepancy in numbers being nearly proportionate to the amounts of material removed.¹³

13 In the bottom layer occurred also some fragments of quartz-like material.

roughly classified the osseous remains of the animals consumed by the mound builders, very little more can be said at present, inasmuch as the species represented have not yet been carefully identified. Taking the most general view of the collection and its occurrence it may be affirmed that bird and fish bones showed a decided decrease towards the bottom; whereas mammalian bones increased in the same direction both in number and size, if not in actual variety of species. Especially was this true near the top and bottom of the lowest layer, due probably, as has been suggested, to artificial manipulation of the mound material, which if a correct view, invalidates in a measure the general statements about occurrences in the bottom layer. However, these general facts are in agreement with Dr. Uhle's observations.

More specifically, *carnivores*, of which there were a few small representatives, seemed to be confined largely to the burnt layer, while ungulates prevailed throughout, one species of deer being however apparently limited to the upper ten layers. In the lowest layer occurred large fragments of spongy bone, and also numerous vertebrae of the cetacean order. In one case only, near the top of the layer, was found parts of the bones of some cetacean lying apparently in their natural order.¹⁴ (This it will be seen is evidence against the idea of artificial manipulation of the layer). Parts of the scapula of one of the largest ungulates represented was found on the bottom, below the water level; and three vertebrae with the limb bone of such others were met with only two or three feet above. At the bottom occurred also fragments of the roots and tips of antlers, besides two heavy wedge-like implements of the same material.

Artifacts—Considering an artifact to be any object "worked" for a more or less evident purpose, there were found in this excavation, as already stated, 70 pieces about which this can be no doubt. Objects of stone slightly outnumber those of bone; but, to counterbalance, all the former with the exception of two charmstones, are mere fragments while of the latter there are several complete and comparatively fine specimens. If the so called charmstones, about the use of which there is so little certainty, be eliminated, the objects fall into the following classes:

- Utensils—mortars and pestles—27.
- Implements—awls, wedges, bone blades—21.
- Weapons—spear and arrow points of bone and obsidian—6.
- Ornaments—Tubular bones, bird + human(?)—7.
- Miscellaneous worked stone—3.

There may, however, be some risk in attempting to classify objects according to their uses when these are not, as is often the case, altogether apparent. It seems, therefore, well in this case to adhere to Dr. Uhle's scheme, based on the materials of which the objects are made.

A. Objects of Stone

The objects made of stone comprise chiefly fragments of mortars and pestles; in addition four incomplete "charmstones" and also a few miscellaneous worked pieces. The materials represented by these objects include several grades of sandstone and quartzite.

1) The mortar fragments represent vessels of varying sizes and shapes. Nos. 9612a and 9643 e.g., are neatly rounded borders of what were probably concavo-convex mortars; while nos. 9612b and 9640 appear to be the broad flat rims of flat bottomed forms with straight but oblique exteri-

14 Found on the same level and very close to human remains no 4.

ors. Number 9520 is a comparatively large fragment of a shallow mortar of less than six inches in diameter and with only a slightly worked exterior. A better example of a good sized mortar hollowed out of a rough boulder is no. 9649, found about two feet down in the eleventh layer. It is the largest piece occurring in the excavation.¹⁵

2) Pestle fragments are comparatively scarce, one only being found in the third, and another in the fourth layers, with the remaining five occurring at different levels in the substructure, the last of them, no 9672, exactly in the water line. The fragments are rather small and consist of one complete and two partial cross sections; the rest being longitudinal sections, in all cases but one, from the heavy end of the pestle.

Roughly considered, these objects increased in frequency down to and including the top of the bottom layer: below that level there were only nine small and one large fragments, rather evenly scattered. The workmanship of these ten is noticeably inferior to that of the samples from the superstructure although there are samples of ground stone even in the lowest layer e.g., no. 9656. The rather curious fact about these fragments is their diminutive size. One is not a little inclined to accept the explanation suggested by Rust that these household utensils were often purposely shattered by attacking enemies.¹⁶

3) Of the charmstone type there are only three forms represented, viz., the oblong, the pear-shaped and the [globase]. The last named is a new form, Dr. Uhle having none like it in his collection. This specimen, no 9621, is almost complete, lacking only one of

its two projecting points or axis. It shows distinctly the pecking traces by which it was brought into shape, the same being [marred] only by two opposing sides being ground and polished down into gradually approaching planes. The pearshaped stone, no 9619, has also one end of its axis broken off. It was made from a stone too small to allow a symmetrical specimen; but in so far as finished it has been brought down to a semi-polished state. The remaining two specimens are represented only by fragments. No 9589 is an end section, 2 inches long, apparently of the common symmetrically oblong form; and no 9630 is a four inch section or a little more than half the entire length of a similar form. Both the last named are pecked but unpolished. All four pieces are found in the superstructure, no 9589 in layer III and the other three close the surface of layer XI.

4) Of miscellaneous pieces of worked stone there is no 9591, a sample of yellow ochre-like material with noticable scratches, occurring in the third layer; no 9607a, a fragment of quartzite with opposing, but approaching, [ground planes], taken from the fourth layer; from which was also obtained no 9607b a thin blackish piece of shale or schist with sharp edges such as might well have been used for scraping surfaces. There are, lastly, three pieces of worked sandstone from layer XI.

5) The five obsidian pieces, nos. 9596-9600, obtained with burial no 3, are very poor specimens of workmanship compared with some of those found by Dr. Uhle.

B. Objects Made of Bone and Antler

The objects made of bone and antler occurred irregularly throughout all levels of the shaft. Strangely enough, the type of objects and qualities of workmanship do not vary quite as might have been expected. There are (really) more types in the bottom

¹⁵ Dr. Uhle has some smaller forms of mortars, but hardly so many fragments. The fragmentary condition of the mortars is itself an interesting question.

¹⁶ Horatio N. Rust—A Cache of Stone Bowls in Cal., Am. Anthropol. Vol VVVI; No. 4., p 686.

layer than in all the other layers combined; while the workmanship, so far as types can be compared, is, in some instances, little inferior in the lowest layer. But on the whole there is, as in the case of stone artifacts an advance towards the top. The bone artifacts fall into six general types:

1 THE AWL-TYPE OF IMPLEMENT

a) In the upper four layers occurred a form of awl of which no 9610 is the finest of four complete specimens found. It is a dagger shaped tool of about five inches length, curving gracefully to a fine point and maintaining in some instances, a very high polish. The tool is split from the of deer with its portion of the condyle left to afford an easy and secure handhold; and in most cases the cross section is concavo-convex, giving more strength the implement than if the inner channel was obliterated. It is termed by Dr. Uhle the *common awl* and is illustrated on plate IX, figs. 1, 2 and 3; none of which, however, are equal to the specimens found in the shaft.

b) Another form of awl occurring in layers VIII, IX and X is represented by no 9625. It is likewise split from the shank bone, but is more slender, triangular in connection, and nearly two inches longer.

c) A third form of awl, no 9635, was found in the eleventh layer. It resembles somewhat the first form described, but is broader and hence more deeply channeled, being made from a different and longer shank bone. The form is figured by Dr. Uhle as no 28 and mentioned as having a "peculiar shape".¹⁷

d) The fourth well recognized form of awl represented by only a fragment, no 9893, is made from the ulna of the deer, the olecranon

being used as handhold.¹⁸ Dr. Uhle found complete specimens of this form and figures are on page 69.

e) The last recognizable awl form, no 9636, is made from the distal end of the large of a deer. The specimen, if complete would measure about eight inches in length; but the head of the tool (formed by the condyle) and also a section near the point was crushed and lost in excavating. It is a unique piece because it is still largely in the rough, just as left after the dorsal side of the bone was split off, only the point being smoothed down.

A still more interesting specimen is no 9626. It is made from the bone also; but the fracturing process was evidently not successful, the side wanted breaking off too short, leaving however an asymmetrical blunt point which shows evidence of considerable use. If this bone was fractured simply for the marrow, as is apparently sometimes the case, then it is a fine example of the accidental tool, serving as a transition between natural implement which met the first needs of primitive man and which probably suggested the artificially improved types.

f) Beside these well defined forms a miscellany of pointed bones occurred. Some of them are apparently mere accidental splinters; others show marks of use, although, aside from their pointedness, they are not naturally adapted for tools. No 9593 already referred to under the fourth form seems to have been used in its fragmentary condition. Nos 9633 and 9659, very sharp pointed splinters from rather heavy limb bones, are two and one-half and three (2 1/2 + 3) inches long respectively, and the former has been worked down somewhat in the form of a three-[cornered] drill point. It might well have been used to point a weapon, but it shows no evidence of having been attached to anything.

17 Compare also figures by Smith from the Lower Frazer River in British Columbia. Mem. of Am. Mus. Nat. Hist. Vol IV, p. 174).

18 See Moorehead—Prehist. Implements, p 142. (from [Tennessee])

Finally, no 9660, an unrecognizable fragment of bone shows longitudinal scratches and other indications of having been used as a pointed instrument although the point is now missing. The two last mentioned objects occurred in the bottom layer.

2 THE "PAPER CUTTER" TYPE

Near the bottom of the last layer was found, side by side, two peculiar long thin curved blades, nos. 9666 and 9667. They were found unexpectedly and as a result came out in a fragmentary state. On cementing the pieces, however, the result is two nearly complete implements. One is plainly made from a large rib, shaved down on the inside and brought to a dull point by the irregular cutting or wearing away of the margins. With the head end missing, and discounting its curve, the tool measures eight inches in length. The other specimen is a very neatly made object. It is a thin, smoothly worked blade, expanding in its seven inch length, by straight margins, from what was probably a blunt rounded point to one and three eighths ($1 \frac{3}{8}$) inches in width. The implement has a slight transverse as well as a longitudinal curve, and thickens a little towards the point. The most remarkable feature about the specimen, however, is the appearance of ornamentation on the convex side, consisting of two rows of dots impressed in wavy lines along the margins. It is the only sign of ornamentation of its kind found in the mound, and being an example of art purely for its own sake, coming from within three feet of the bottom, it seems worthy of special attention.

In addition to these two is no 9648, a $3 \frac{1}{2}$ in. section of a $\frac{1}{2}$ inch wide rib shaved quite thin and somewhat polished on the natural side.¹⁹

19 Dr. Uhle on pp 73 and 74 describes fragments of several such implements, one of them, ornamental with geometric figures, and all occurring in the lower layers.

3 THE ARROW POINT TYPE

A third type of artifact of which one good example, no 9663, occurred three feet from the bottom, is a small lanceolate blade termed "arrowpoint" by Dr. Uhle, who found several similar forms in what he called the eighth layer.²⁰ This particular specimen is about half an inch wide at the collar and tapers to a point, the whole blade from collar to point being little more than an inch long. The constricted stem is incomplete but it is interesting in that it shows plainly the whittling process by which it was brought into shape. Some slight traces of asphalt still remains on this part. No 8870 (fig. 15, Pl. IX) of Dr. Uhle's collection is almost an exact counterpart of this specimen.

4 THE WEDGE-LIKE TYPE

Implements of the heavy wedge-like type occurred only near the bottom. No 9674 is wedge made from a split elk horn. It is $5 \frac{1}{2}$ inches long, 2 inches broad, and nearly 1 in thick. A fragment is knocked from one corner of the butt end and the softer inside structure is partly dissolved, but the natural exterior with the somewhat dull cutting edge is all intact.²¹ Almost alongside this was number 9673, a slightly curving pointless antler, oval in cross section, with the flat sides smoothed by use. The missing point was apparently destroyed by fire, leaving a section $3 \frac{1}{2}$ inches long. The butt end has the appearance of hard usage, several chips of the surface layer having been split off. No 9665 is the gathered fragments of the point end of a similar implement about, 1 inch wide, found three feet from the bottom. It presents a fine

20 See pp 41 and 76; and figs 11-16 Pl. IX.

21 In Dr. Uhle's collection there were no forms like the 1st, and none exactly like the 3d; but quite a number of the 2d form occurred in layer 7, 8 + 9 (see Pl VIII figs 1, 2, 3 and 7).

gathered fragments of the point end of a similar implement about, 1 inch wide, found three feet from the bottom. It presents a fine semicircular cutting edge slightly polished and also blackened as if by fire.²²

5 THE SAW-LIKE TYPE

Another type of implement is the so called saw, or, as termed by Dr. Uhle, saw-like notched bones. Of these peculiar objects six fragmentary specimens occurred, no. 9584 in the second layer, no 9613 in the fifth layer; nos. 9652, 9661 and 9662 in about the middle of the eleventh layer, and no 9671 at the bottom of the mound, i.e., from below the water level, but under circumstances that warrants the genuineness of the find. The first, second and last of these pieces are alike made from the scapula of some not very large ungulate; and the notches in each case on the posterior border.²³ The notches are irregular both as to depth and interval, those in no 9584 being cut rather deep, apparently with a thin sharp tool; but the others, likewise probably started with a cutting tool are shallow and rounded at the bottom as if worn by a string.

Nos. 9652 and 9661 are fragments of what may well be taken for fish bones, with quite irregular shallow notches. The teeth on each piece tend to point in one direction. No. 9662 is the most interesting and suggestive specimen. It is a small fragment of channeled bone, one irregular and thick margin of which has nine smooth and shallow notches running across it. On the opposite margin, but nearer one end of the bone, is a large smooth groove slanting across the face of the bone towards the small notches. There can be little doubt

that the small notches were worn by strings running separately across one edge, and that these same strings gathered into a bundle produced the large groove on the opposite edge. This implement, as no other of its type found in this region, tends to confirm Dr. Uhle and Prof. Ranke's suggestion that they were used for some kind of weaving.

6 THE TUBULAR BONE TYPE

The last type of objects to be described from the excavation is the tubular bone. These pieces are mostly hollow bird bones from one to three inches long, with square cut ends and varying degrees of polish. They occurred in the second, fourth and eleventh layers; and of the five specimens found only the one from the second layer, no 9588, is complete. This piece shows some transverse lines produced by a fine edged cutting tool, and also some indentations made by teeth; but its polish is not so marked as in the case of fragments no 9634, found on the surface of layer XI. The remaining pieces from the fourth and the middle of the eleventh layers are less characteristic; being in a partly dissolved state. One other specimen of tubular bone, of a different character, occurred in the tenth layer. It is a piece, 3 1/2 inches long and 7/8 inches in diameter, made almost certainly from the distal end of a human upper arm bone. One end is cut off and smoothed, the other was fractured in unearthing.

In addition to these artifacts above described there are about fifteen stingray spines, found in a bundle on the chest of human remains No 3, in the fourth layer. They show no particular preparation for attachment, or any signs of use; and yet, the fact that they were found with weapons of obsidian and other things useful and ornamental makes it seem likely that they also served some useful purpose.

Comparing the results of the two excavations in reference to artifacts, it is to be observed that Dr. Uhle's collection furnishes

22 Dr. Kroeber says that similar implements are still in common use by modern Indians of the Coast.

23 Illustrated by Moorehead—*Prehist. Impl.* p 236.

several more types, among them: sinkers, such as no's. 8669 and 8534 (figs 20 and 21), found near the surface; straight and curved bone needles, and also a variety of types of ornaments found in the graves. The present collection does however, as pointed out, furnish some additional forms of the old types. As a curious coincidence may also be mentioned the fact that the number of objects in the two collections are almost in exact proportion to the amounts of material removed.

THE BURIALS

Four graves were discovered in this excavation, all of them as it happened, along the same corner of the shaft, but partly outside it, and at widely different levels. Three of them occurred near the surface of the mound and the fourth at a depth of sixteen feet. Only two of the remains were complete, and but one those furnishing any artifacts. Separately considered the four finds were as follows:

No. 8669, a complete adult skeleton in comparatively good condition, found in the

second layer, about a foot and a half below the surface and just outside the uphill wall of the shaft. The position was level supine, head south, face west; left upper arm extended at an angle to body axis and forearm parallel to same; right upper arm parallel to body axis, forearm crossing body leaving hands in close proximity; legs drawn up loosely at right-angle to body axis with knees to the left. The skull was crushed.

No. 8670, a separate skull found in an upright position outside the shaft in the third layer. It fell to pieces on exposure, but a low brow and strong superciliary ridges were noticed.

No. 8671, a complete adult skeleton, found near the bottom of the fourth layer or about 5 1/2 feet below the surface, with only the proximal end of one femur extending into the shaft. The remains lay on the left side in a doubled up position and on a slant, the pelvis being lower than the head, which was north-west. Spine was curved and the legs were flexed with the knees (pointing north-west and one of them) brought up on line with



The left half shows also the first four layers as they appeared in the uphill wall.

[no 3]

top of head, but nearly a foot away from the face. The arms were flexed with hands laid together under the cheek. On the neck and chest of this individual was found the obsidian blades and stingray spines already mentioned, and between the face and knees occurred a fragment of an awl of the first form, no 9603; the small agate-like pebble, no 9601; and also no 9602, a rather pretty piece of coffee brown chert with some discoidal fractures.

No , the partial remains of an adult occurring three feet below the surface of the eleventh layer. The position was level, supine, head south-west; lower girdle with lumbar vertebrae in natural order; left leg and arm flexed and laid alongside trunk. The skull was entirely missing, and the right appendicular parts were represented only by the proximal end of the femur and a short section of the tibia, both showing old fractures. The burial was evidently secondary.

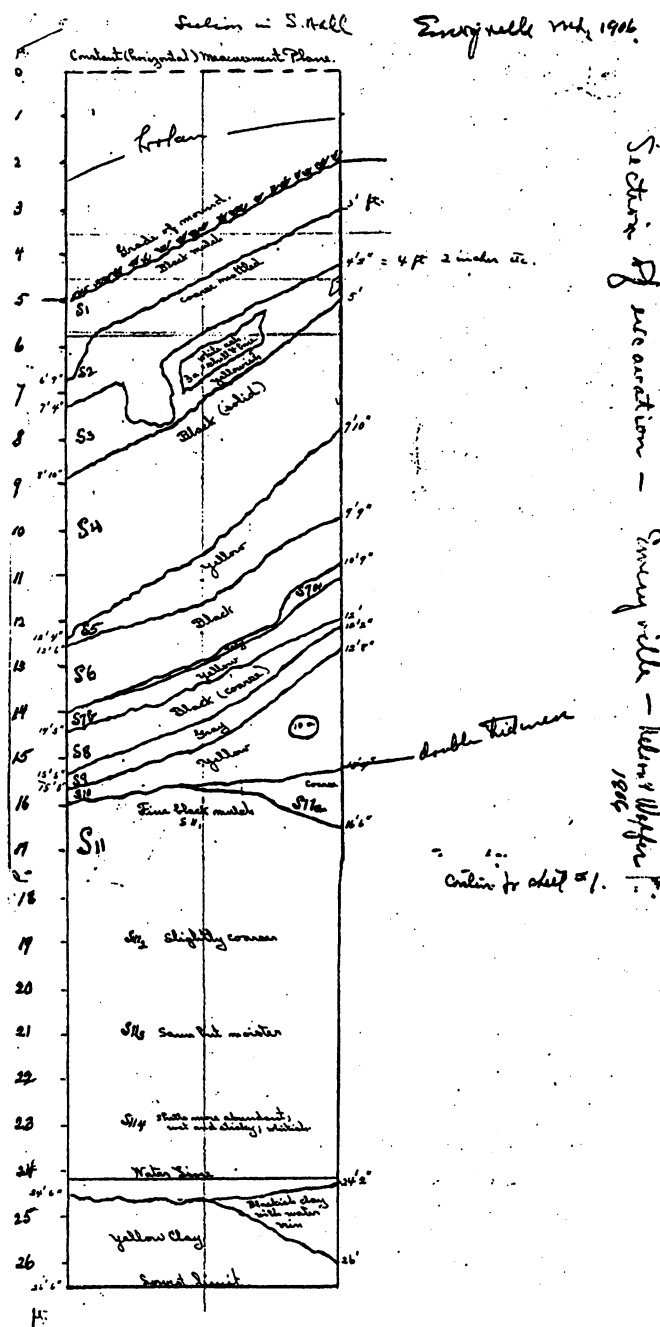
Of cremation there was no sign near the surface, as was the case on the sea side of the mound. But the small area excavated hardly allows the assertion that cremation might not have taken place. Dr. Uhle, on the other hand, found no burials near the surface, which fact likewise must for the present remain inconclusive.

The facts stated, there remains but to

briefly compare conclusions. On some specific minor points there has been shown to be discrepancies, but in reference to all the broader and really significant facts there is all the agreement that might reasonably be expected (in so unscientific a structure as a shellmound.) (Not one absolute contradiction is apparent.) There is agreement in regard to the bottom of the mound as below sea level; the internal structure is quite similar on both sides, the only exception being the fact that layers are more readily distinguishable near the bottom on the sea side; and the nature, frequency and relative order of occurrence of artifacts tallies to a surprising degree. The only contradictory facts is the apparent substitution of cremation for burial in the upper layers on the sea side, and the lack of signs of cremation near the surface on the land side, where burials are frequent. However, without further superficial excavation on both sides of the mound, it is hardly safe to accept either fact as conclusive, unless as seems probable, the mound in the course of its growth was building towards the east, or land side. In that case Dr. Uhle may be assumed to have worked the older part of the deposit; and the burials near the surface on the east-side may be indications of a fourth and later people who contributed the last additions to the mound.

N.C.N.

Reproductions of
Maps, Diagrams, and Letters

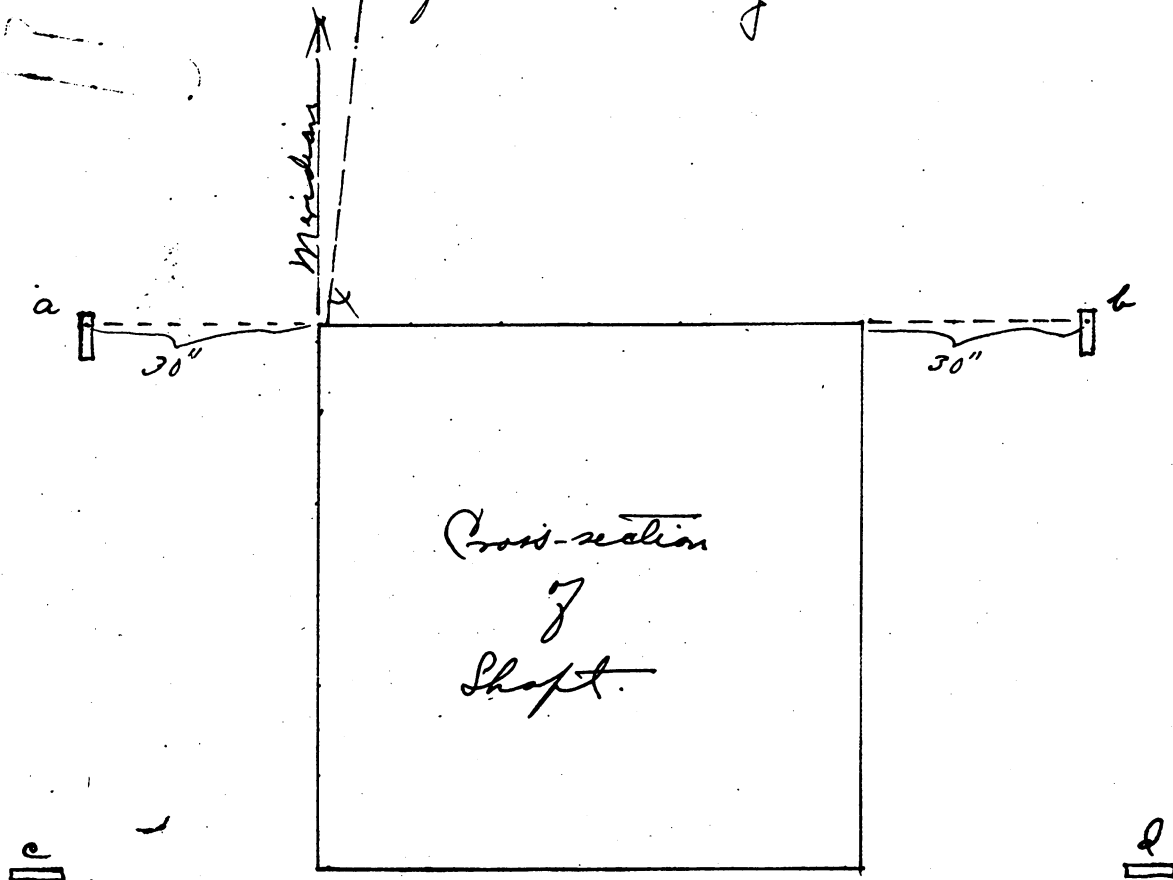


The above is a copy of the original section. You will see that the measurements were all made from an arbitrary designated plane from 2-5 ft. above the sloping side of the mound, hence to get actual depths of any sample you'll have to discount according to your own judgment. The elaborate section was indicated by Dr. P. A. Barrett and not by myself.

n.e.n.

Ia

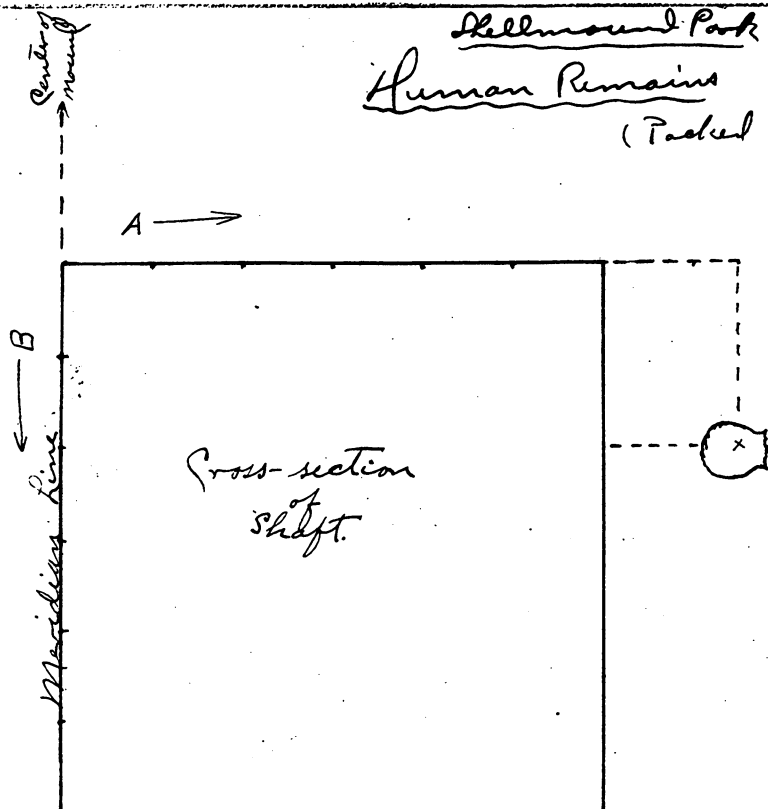
Diagram to aid in relocating shaft
and for determining water level etc



Explanatory: *a b* and *c d* are stakes (made of 6" board and put down solidly) marking the position of shaft and also baselines for all measurements. *a* and *b* are on a level (the chosen surface level), and the line from nail to nail determines one face of shaft. *c d* are on a level (the chosen surface level) and exactly three feet (3') below level of *a b*. But *c d* are not put down (like *a & b*) at any fixed distance from shaft - owing to a "cave in" - *x y* approx. direction for water level marks on Pavilion.

Shellmound Park
Human Remains
(Packed as number 25)

III.



Actual Position

$$a = 7' - 6''$$

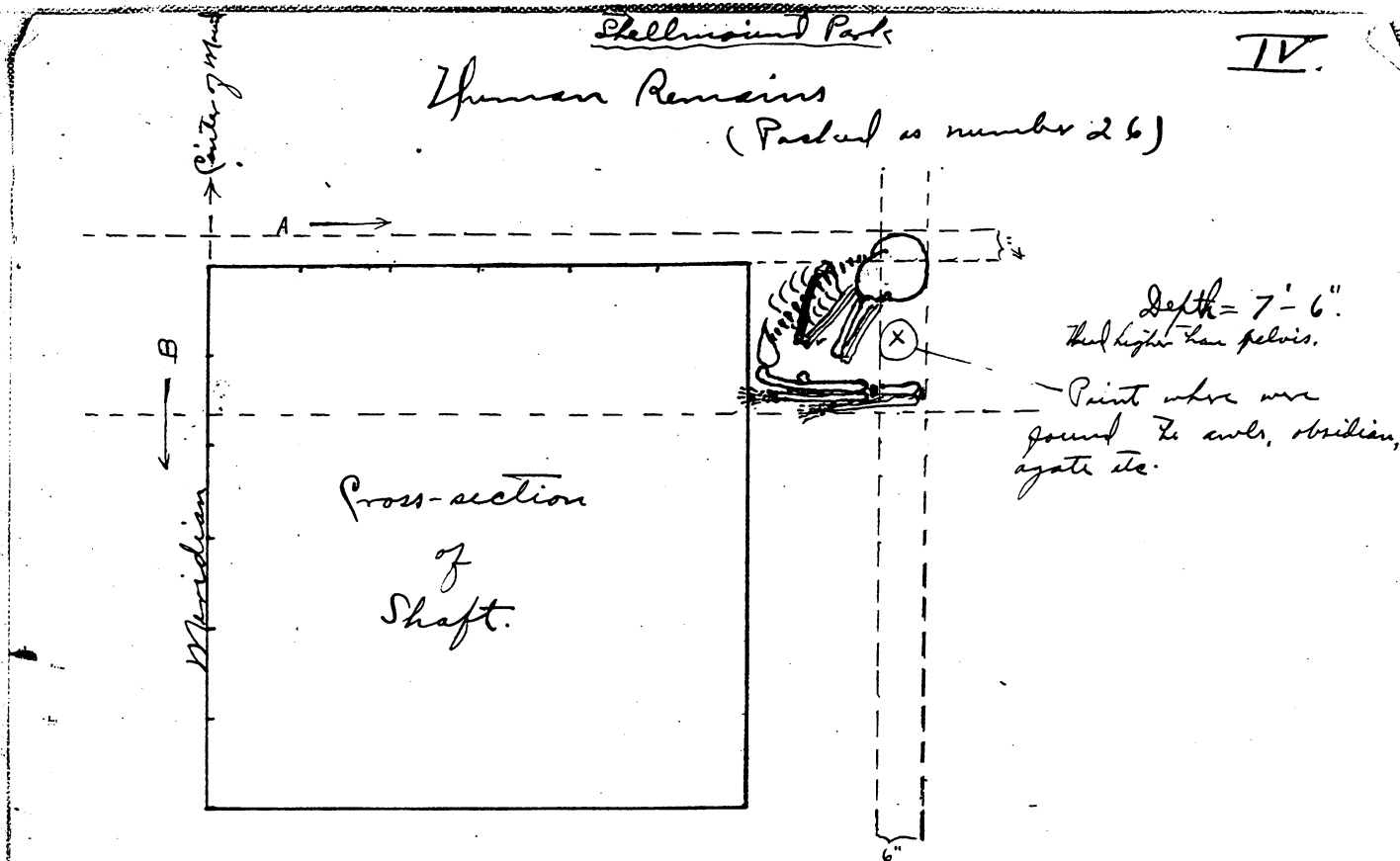
$$b = 2' -$$

$$c = 5' -$$

Skull placed in
almost erect posture.

Scale: one space (1 1) = 4 inches.

n.c.n. 6-5-'06.

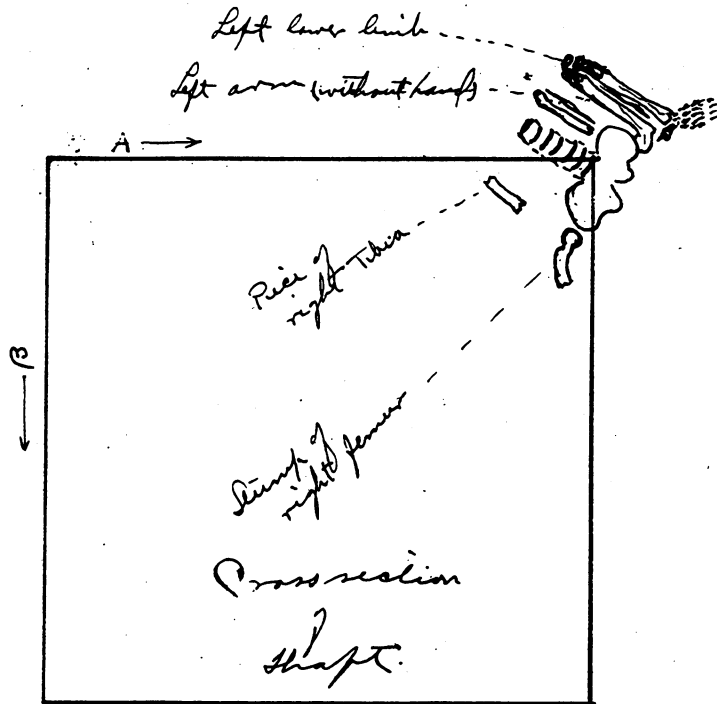


Shellmound Park

V.

Human Remains

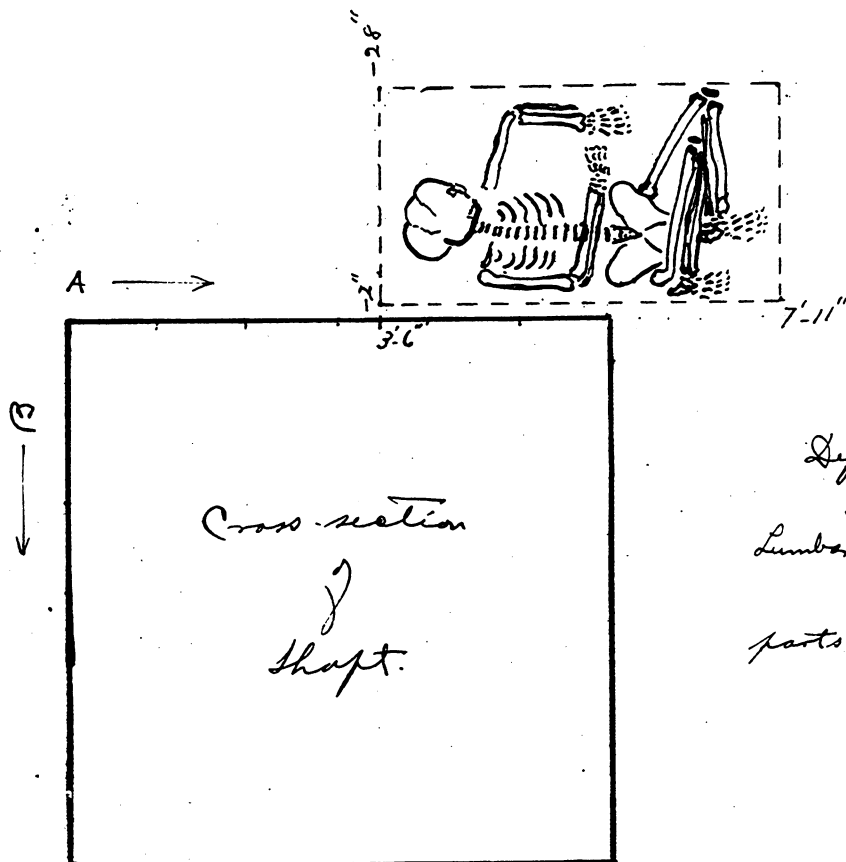
(Packed as inv. 82)

 $a = 4'-9" \text{ to } 6'-9"$ $b = 1'-4" \text{ to } -9"$ $c = 18'$ i.e. about

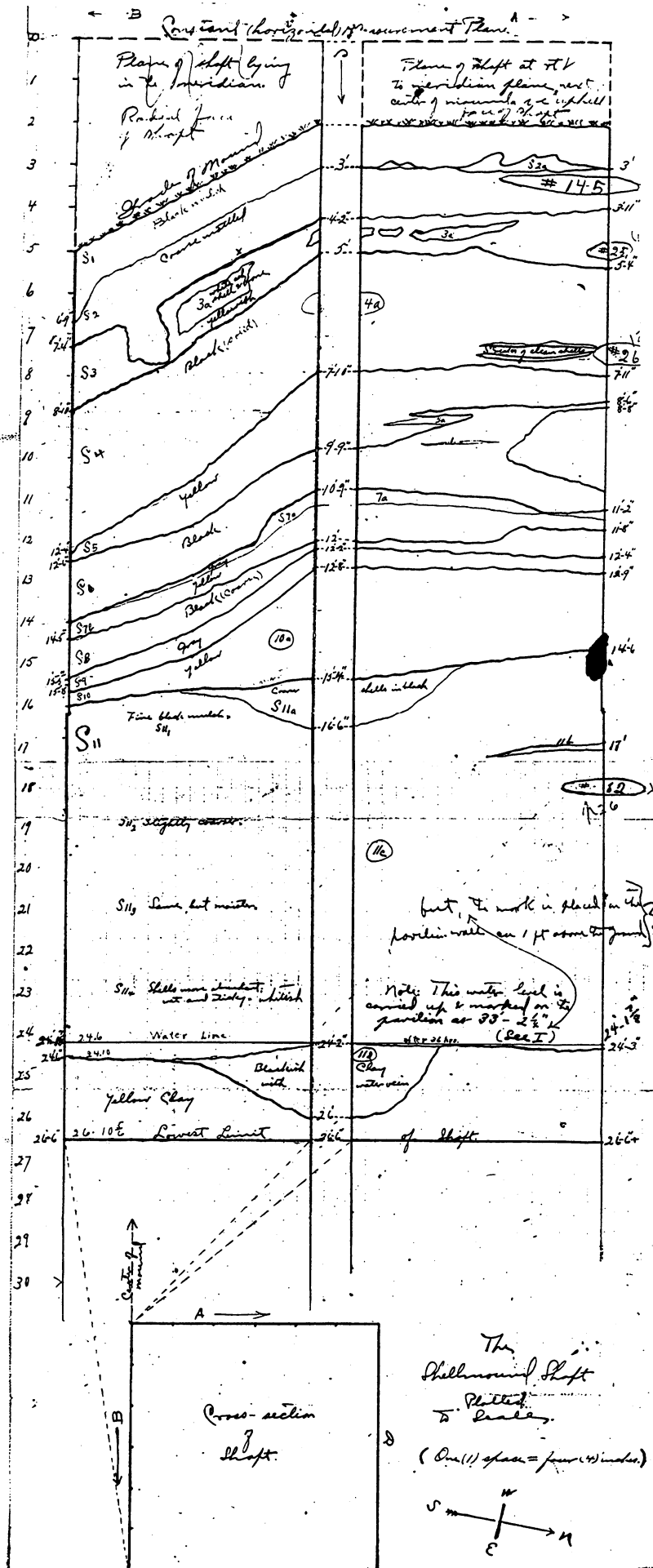
4 or (3) feet below
ground bottom profile or
3 ft below level of railroad.

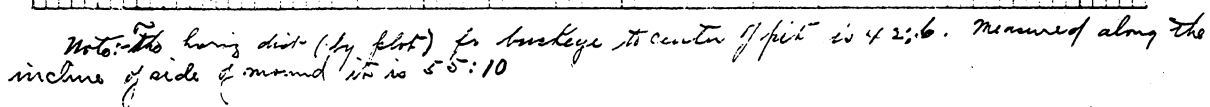
Shellmound Park
 Human Remains
 (Packed as no. 145)

VI.



Synth:
 Skull 3'-3"
 Lumbar Vert. 3'-9" is in
 the second stratum,
 parts touching the top of S3.





Showering Bladder's level of Fe^{2+} origin — even lower and muddy too — and about 1000 feet from upper 9 concretion and band of datum line). Level of Fe^{2+} origin on line is same as level of

cents. pt. of church.

Level of upper wall
Level of lower wall

level of the bottom will on piece at corner of bank.

[illegible]

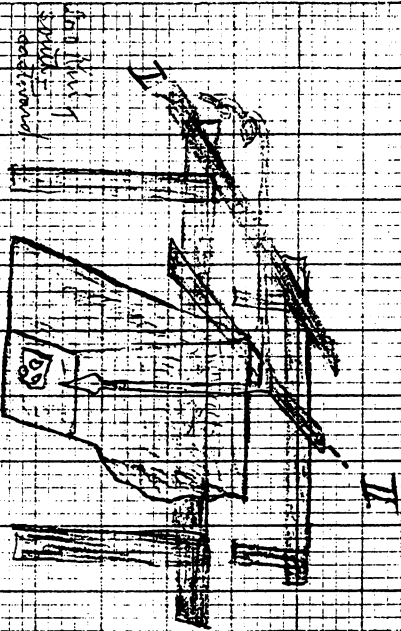
2. Confidential to
cc

2.) All measured on the meridians of the ground. The remaining the opening of the shaft is furnished at the

corner of ferris on
E side of shaft.

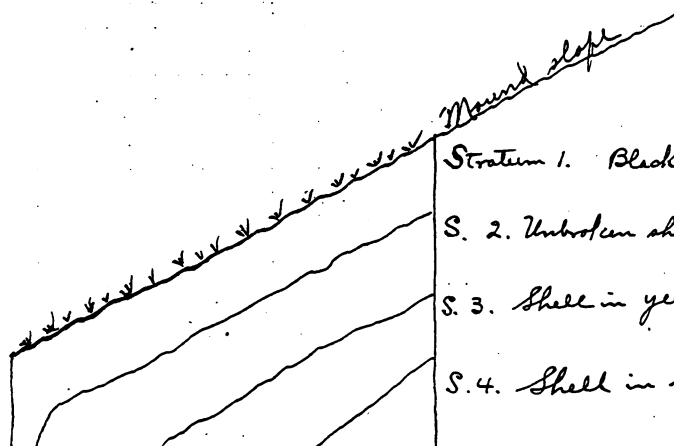
There is about 2 in.
lower than the
overlaid

not apparent to scale
June 17 '06

[illegible]

Emeryville
Radial Section
(2 sheets)

Draw
1915

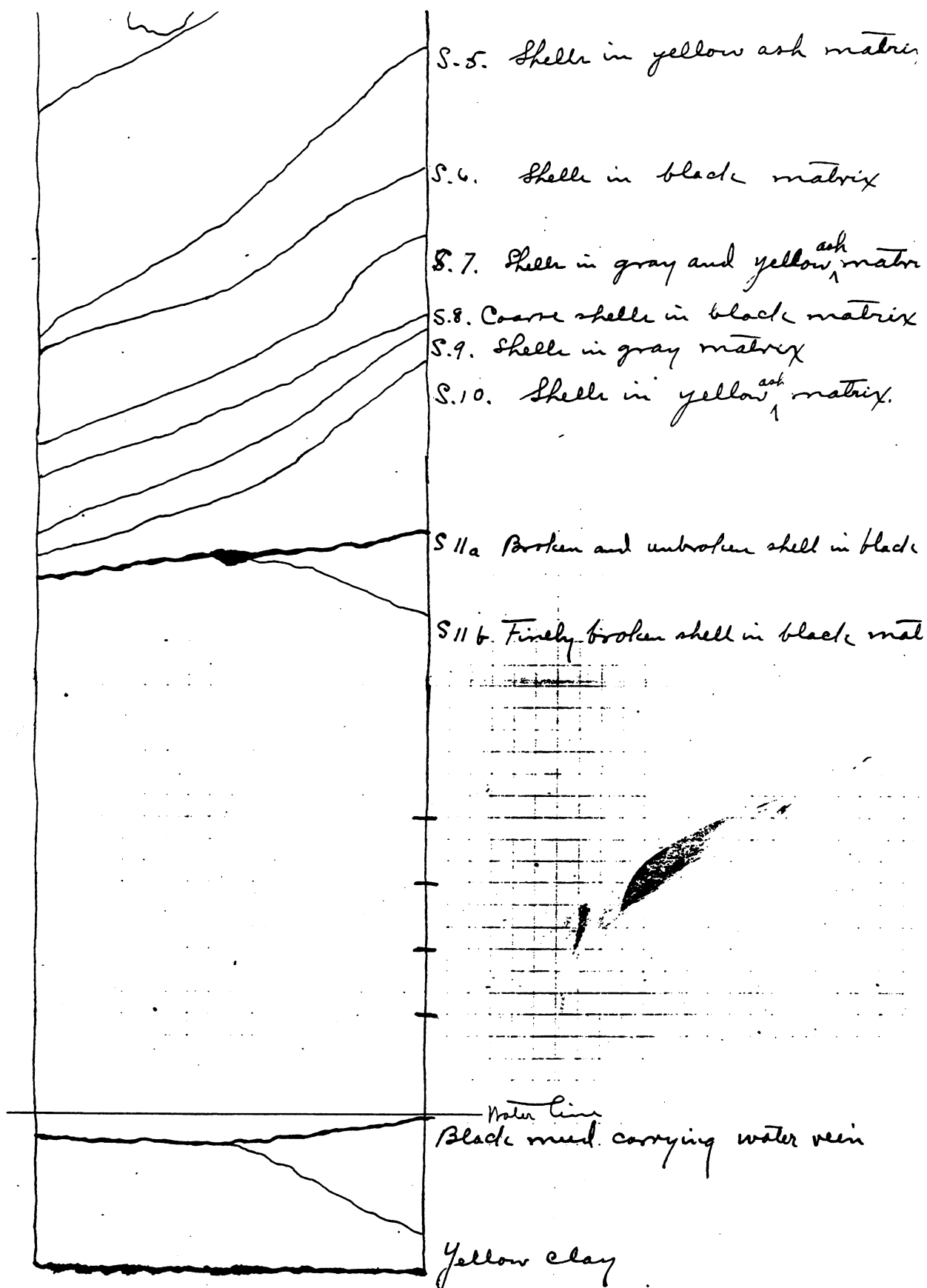


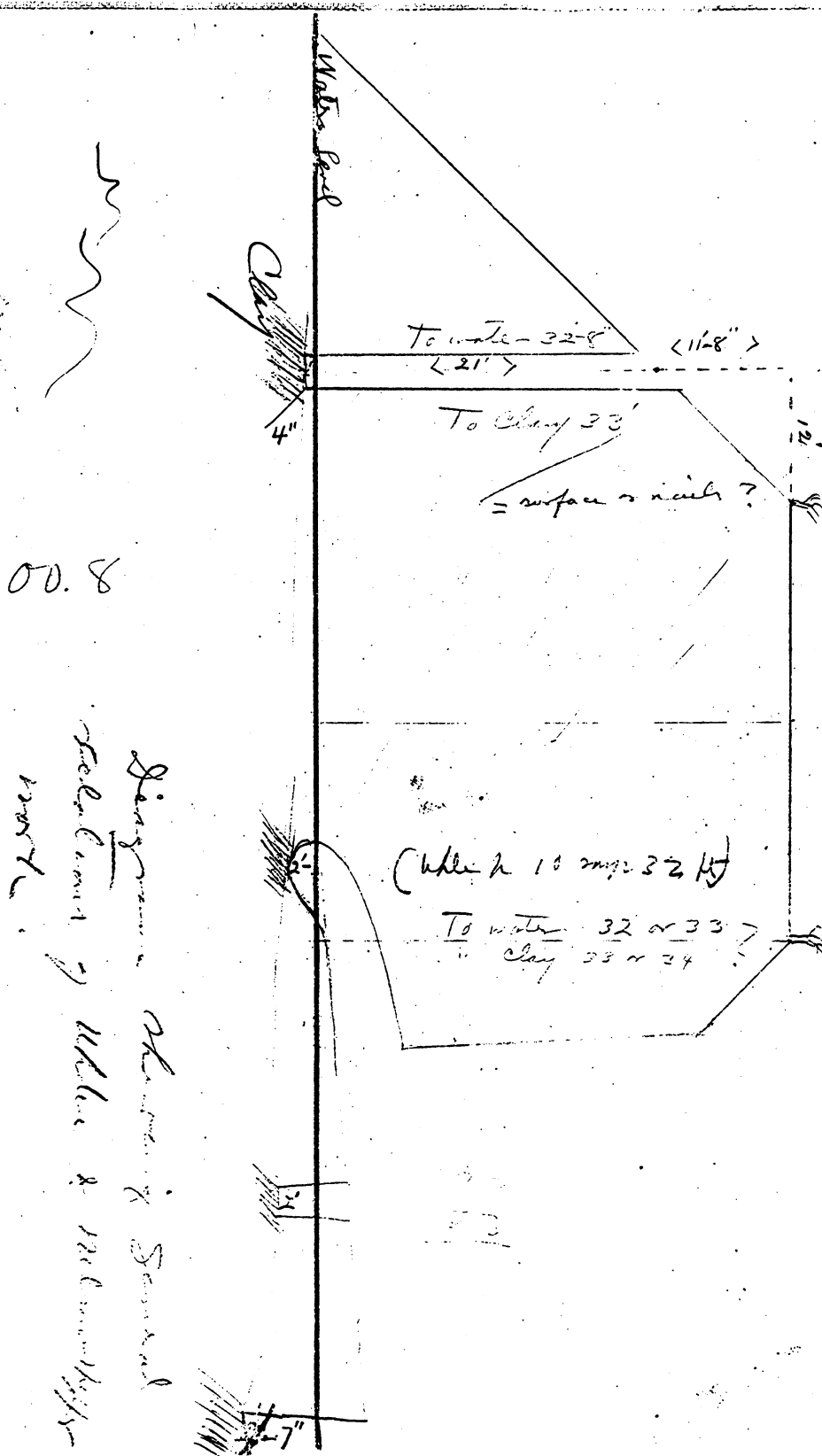
Stratum 1. Black mulch, mostly disintegrated shell

S. 2. Unbroken shell in matrix of black & yellow.

S. 3. Shell in yellow and white ash matrix

S. 4. Shell in solid black matrix





Excavations on the
Northeastern Slope of
the Mound at
Shell Mound
Park
Emeryville,
June 1 to

S. C. Barrett

UNIVERSITY OF CALIFORNIA
DEPARTMENT OF ANTHROPOLOGY
BERKELEY, CALIFORNIA

June ¹⁹~~20~~, 1906.

Prof. J.C. Merriam,
University of California,
Berkeley, California.

My dear Dr. Merriam:-

According to plan I am leaving for the north day after tomorrow. The excavations at Shell Mound seem to be progressing very nicely. I visited the mound about noon today and at time the depth was about 20 feet. The character of the bone objects found in the last four feet or thereabouts is very different from the character of the bone found in the higher strata. At the present time they are working in an almost level stratum of heavy black fairly compact earth containing much broken shell, many bones and many stones. Nelson tells me that near evening today he sunk a small pit in one corner of the shaft to a depth of about three feet beyond the floor of the present level and found that at two feet or so the evidence is quite strong that the bone, stone and other signs of human agency are about at an end; but the black earth still continues. In all probability the bottom of the mound will be reached within a short time, but there is a sufficient amount of the appropriation left to carry the two men about ten days, which will, I think, easily insure their reaching the bottom of the mound.

I have left the management of affairs until your return in the hands of the two, Nelson being responsible as before for the shaft and Goddard for the labeling, note

keeping, packing and shipping. I have asked them, when they have reached the bottom of the mound so that they have a complete radial section, to plot to scale in detail the radial wall and the uphill wall, which is at right angles to the radial. Having done this I have asked them to write up in full the notes upon their particular parts of the work, each one referring as needed to the work and notes of the other, that is to say, Nelson's report will be a complete and detailed report of the shaft with special reference to the stratification, pockets of peculiar earth and ash, and the general character of the remains found in each layer. Wepfer's report will deal particularly with the specimens themselves, noting all striking points about each, as also the general character of the strata in which they were found and the general surrounding conditions. These reports I have asked them to leave with Miss Jones for you in case you have not returned when they are finished.

I saw the younger Mr. Siebe today concerning our leaving the shaft open until your return and he assured me that it would be entirely agreeable to them to have it left open provided, of course, the time was not too long. Mr. Nelson will attend to the covering of the mouth of the shaft when it is ready to be closed and will nail the cover very securely upon the standards in such a manner that there is very little doubt that any one will disturb it. I told Mr. Siebe that you had written that you expected to return to Berkeley at the end of the month, but that it might be possible that you would be detained and would not arrive until the first week of July, thus making provision for an emergency. Of course Mr. Siebe would like to have the shaft closed up as soon as possible after

you have finished with your inspection. Mr. Siebe thinks it advisable that a watchman be left with the shaft on the few picnic days which may occur between the time of the final closing of the shaft and the time of your arrival, and I have asked Mr. Nelson and Mr. Wempfer to arrange the matter of watching between themselves, and they say they will be entirely responsible for the shaft until after your arrival and will arrange it so that either one or the other will be there on picnic days, or in case they are unable to come themselves will see that some one is on hand.

Mr. Siebe also gives us permission to do some drifting, if desired. This privilege I asked of him some days ago as I thought that if I heard nothing from you and there was a sufficient amount of appropriation left at the end of the work to warrant such excavating, it might be advisable to do a little lateral work along on the level in which the complete skeleton was found. From the circumstances surrounding this burial it seems possible that there may be others along this same level and that a little lateral work, to prospect for them, might be profitable if the money was available for it.

It is probable that both Mr. Nelson and Mr. Wepfer will be in town when you return, and certainly one of them will be so that you will be able to connect with one or the other or both, and have them to explain to you the condition of the various strata, if you so desire. Mr. Nelson would be especially qualified to do this as he has done almost all of the work of the shaft itself and practically all of the uncovering of specimens has been done by him, so that he knows the general character

of the specimens found in each layer. However, in case you are unable to find either one of the men, their reports will probably be available by the time you return and will, I think, be such that you will be able to determine pretty clearly the details of the conditions in the various strata.

Upon my visit to the mound today I settled in full with Mr. Nelson and Mr. Wepfer for their work up to and including tomorrow, the 20th, as also for all incidental expenses which they had incurred and I am enclosing herewith a full expense account with vouchers for the period from May 28th to June 20th, inclusive. As you will see, this account is somewhat in excess of the check which you gave me before leaving, but this we can settle at your convenience. I told Mr. Wepfer and Mr. Nelson that after the present time I should not be where they could communicate with me and that everything concerning the mound and their wages for work from the 21st on would be left with you.

In buying lumber at the outset of the work we made provision for lumber for casing, 15 feet, as also for lumber for the bulkhead, and so on. The excavations have gone to a greater depth than we have anticipated and some of the lumber has been needed for bulkhead and fencing, but so far no casing has been needed, thus there is left some lumber which has not been used at all, in addition to that which has been used about the bulkhead, and so on. Of the former there is probably not enough to make it worth while to return it to the yard and pay the hauling charges, etc. and I had thought to suggest that if Capt. Siebe is to receive no compensation for the privileges which we have enjoyed, it might be advisable to

leave this lumber for him. I have, of course, said nothing to him or to any one else about the matter and what I have said here is merely a suggestion, and I hope you will consider it only as such.

You will notice that one of the items on the accompanying expense bill ~~has~~ ^{is} a bill running to myself for time put in on the work at the mound. Since you left Berkeley my position has been somewhat altered by my resignation of the Le Conte fellowship and the acceptance of an assistantship in the department, thus removing the objection which I made at the time you mentioned it of taking anything in the way of remuneration for the time which I was to spend on the work of the mound, and I have therefore included in the accompanying statement a bill for the actual time which it took, figured at the rate which you mentioned to me. Had I remained Le Conte fellow I should not have considered it proper to put in such a bill or accept any remuneration for the time spent, or, on the other hand, if my position of Museum Assistant had yet begun I should not consider it proper. However, inasmuch as I at present hold neither of these positions, having resigned the fellowship and the assistantship not beginning until July 1st, and inasmuch as I have spent a considerable of the time which I should otherwise have put in ^{at} my own research work I do not see that there can be any technical objection to my accepting the remuneration of which you ~~speak~~ ^{spoke}.

I am also enclosing herewith my report upon the location of the mound. I think that the report with the accompanying rough diagrams will, in all probability, be sufficient to

6

establish the point at which the shaft was sunk, but if upon your arrival you find that there is anything lacking, as for instance, a measurement to some point toward the center of the mound as well as toward the perimeter, you can have such measurements made without a great deal of trouble, for both Wepfer and Nelson were with me at the time these measurements were taken and they know the points of origin and the lines along which measurements were taken.

Hoping that you will be able to obtain the desired information concerning the level of the floor of the mound from the notes and the inspection of the radial section, I remain

Very sincerely yours

A handwritten signature in cursive script, appearing to read "S. M. Barrett". The signature is fluid and extends to the right with a long, sweeping tail.

EXPENSE ACCOUNT

of

S.A.BARRETT.

FOR ARCHAEOLOGICAL EXCAVATIONS AT SHELL MOUND, EMERYVILLE, Cal.
 FROM MAY 28, to JUNE 20, 1906.

Item.	Quantity	Voucher	Amount.
Lumber		1	14.80 ✓
Tape line			.25 ✓
Stamps			.10 ✓
Coordinate paper			.15 ✓
Twine			.10 ✓
Note book			.10 ✓
Whisk broom			.15 ✓
Films		2	.70 ✓
Padlock		2	.90 ✓
Screw eyes		2	.05 ✓
Plumb bob		2	.20 ✓
Line		2	.05 ✓
Memo books			.25 ✓
Nail bags		3	.65 ✓
Nail bags		4	.35 ✓
Tacks		4	.05 ✓
Tags		4	.05 ✓
Trowel		4	.05 ✓
Film pack adapter		5	1.50 ✓
Cotton		6	.25 ✓
Pill boxes			.25 ✓
Film pack			.90 ✓
Fees to Nelson (May 28 to June 9)		7	24.00 ✓
Fees to A.V.Wepfer (June 1 to June 9)		8	18.00 ✓
Fees to Nelson (June 10 to June 20)		10	24.75 ✓
Fees to A.V.Wepfer (June 10 to June 20)		9	20.25 ✓
Nelson's Expense bill for incidentals		11	5.15 ✓
Typewriting		12	2.50 ✓
S.A.Barrett, supervision of excavations, May 28 to June 20			26.25 ✓
			<u>142.75</u>

Deduct, 1 R. film (returned)

35
142.40

Received from Dr. J.C. Merriam June 26 "06

100.00
42.40

Balance

*white's bills for developing and printing are yet to be added, when
 he sends them in.*

1

H. A. Barrett
Excavations on the Northeast Slope of the Mound at
Shell Mound Park, Emeryville

June 1, to 1906.

In locating the point at which to sink a shaft on the northeastern slope of this mound an offset of 20 feet was taken from the fence which runs along the eastern side of Shell Mound park. The point from which this offset was taken is ~~53 feet~~ 53:10 feet in a horizontal line from the northeast corner of this fence. At a distance of 14:5 feet from the fence which runs along the north side of Shell Mound park there is a very large Buckeye tree on the southern side of which there is a small approximately circular scar about the size of a half dollar, *which will, in the course of two or three years, be overgrown by the bark.* A cross was cut into the wood in this scar and two large nails driven in the upper and lower angles of this cross. This arbitrary point of origin is 1:9 feet from the base of the tree and 3 feet from the first crotch where the trunk branches.

2

With this as a point of origin a second measurement was made along the slope of the mound to the point above mentioned as being 20 feet from the eastern fence. This distance according the measurement up the slope is 55:10 feet, which does not exactly agree with the plot as here given owing to the fact that the plot is, of course, on a horizontal plane and also to the fact that the fence ~~xxxx~~ makes an angle slightly greater than a right angle at its northeastern corner. Measuring on from the point taken as the center of the shaft in a direct line from the Buckeye tree to the eastern fence the distance is 64:5 feet. At this point a line of nails was driven into the top stringer of the fence in order to give a permanent mark as a ~~thin~~ point of origin. The distance from this point to the point from which the 20 foot offset above mentioned was taken is 62:5 feet. In measuring this 20 foot offset a horizontal line as nearly as possible was maintained from the mound to the point of origin on the eastern fence,

3.

also in measuring the distance from this point of origin to the northeastern corner of the fence a horizontal line was maintained and the point on the northeastern corner of the fence which is on a level with this point of origin is 10:3 feet ~~from~~ above the top of the bottom stringer of the fence. The point of origin ~~above the corner~~ on the Buckeye tree is 6:4 feet above the top of the bottom stringer of the fence at this same corner.

In order to have a true section through the mound a radius was, as nearly as possible, determined. This was done by assuming the flagpole which is on top of the pavilion at the top of the mound to be approximately over the center of the mound. With this as a center ~~an~~ an allignment was made so that the radius should pass at a distance of 3 feet from the center of the proposed shaft, this distance, of course, being measured at right angles to the radius. This radius or meridian was found to cross the fence on the east side of the park at a point 7:10 feet toward the corner of the fence from the point from which the 20 foot

4

offset was measured.

With this radius as one side of a square a 6 by 6 foot shaft was sunk.

Datum Lines.

For the purpose of accurately measuring the depth to which the shaft ~~was~~ sunk and the depths at which the various objects are found posts were set and a superstructure constructed above the shaft such that one side of the superstructure lay directly along the meridian, ^{an} ~~the~~ other side being ~~the opposite side~~ directly above the up hill wall of the shaft, and the whole superstructure being constructed so as to cut a horizontal plane over the mouth of the shaft.

~~The~~ On the ^{first} ~~two~~ sides mentioned yard sticks were nailed in such a manner as to automatically give the ^{horizontal} distances of any point in the floor of the shaft. ^{from the meridian} As is shown in the rough drawing there was a third side to this superstructure; placed directly above the down hill wall of the shaft and of course on the same horizontal plane with the other

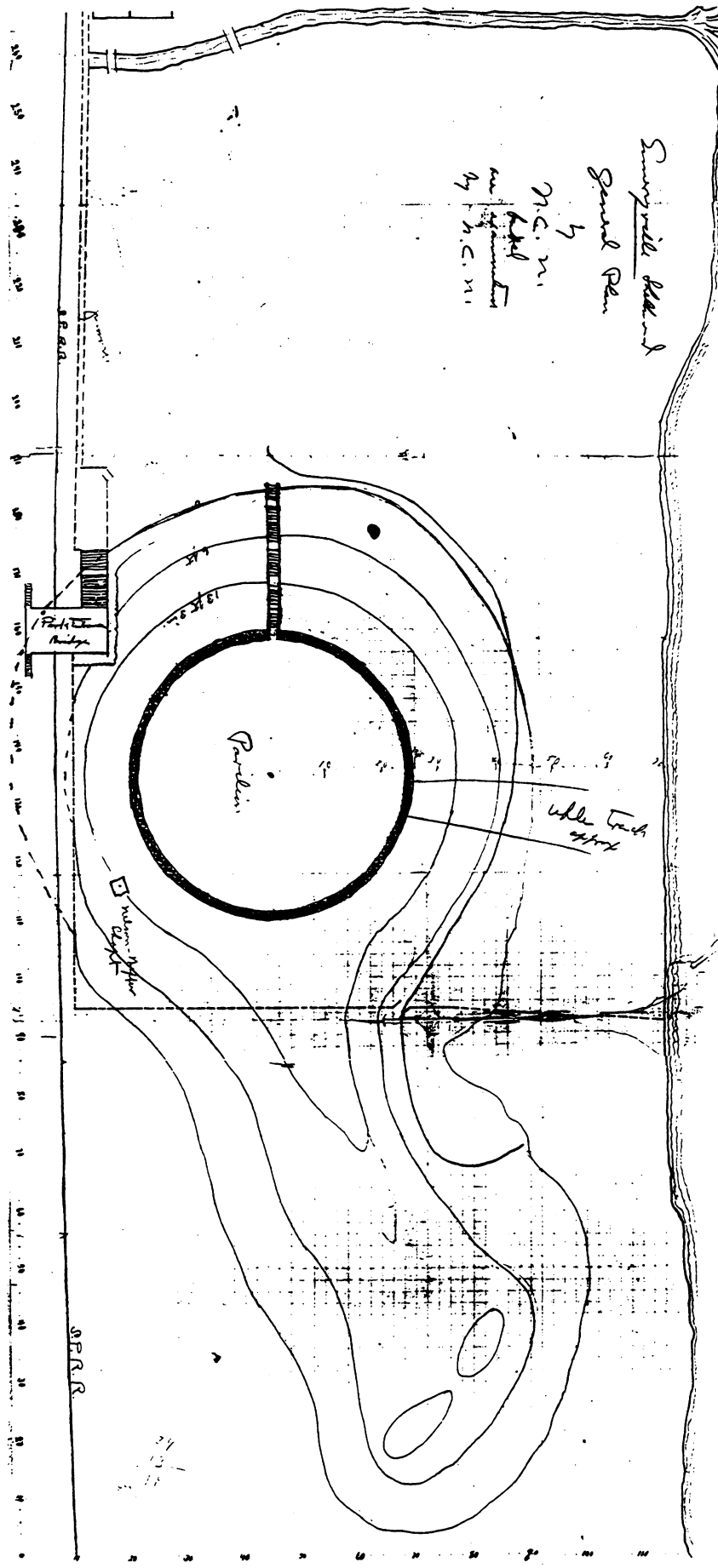
4

two sides mentioned. Thus by running a straight edge, ^{were nailed} ~~to which~~ ^{one to the other of} ~~which~~ parallel to the board which marked the meridian, and from the two lines which were directly over the up hill and down hill walls of the shaft and dropping a plumb bob attached to a tape line to the point ~~in the bottom~~ on the floor of the shaft where any object was found, an automatic and accurate measurement in three dimensions ^{was} ~~would be~~ obtained: *A*, the distance from the meridian northward along the line directly over the up hill wall of the shaft, *B*, the ~~line~~ distance along the straight edge which is parallel to the meridian, and *C*, the vertical distance from the straight edge to the position of the object. This super-structure rested upon four posts, the upper pair of which differed from each other in length about an inch and a half, the northern ~~post~~ ^{at} being the longer; ~~and~~ the lower pair ~~at about the~~ standing in about the same relation to each other. The post ~~was~~ ^{at} the up hill ^{wall} ~~side~~ and on the line of the meridian of the mound was ~~100~~ feet above the

6

mound, while the post ^{at} ~~on~~ the down hill side and on a line with the meridian of the mound was $4;5\frac{1}{2}$ feet above the level of the mound at this point. The difference in level between the up hill wall and the down hill wall of the mound was 3 feet and 1 ~~xxx~~ inch.

6



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